Self-medication with antibiotics in Europe and its determinants

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Chapter 1

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General introduction

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Introduction

The discovery of penicillin by Alexander Fleming in 1928 triggered enormous progress in medicine (1). Since the first generation of antibiotics became clinically available in the 1940s, they have been the cornerstone of infectious disease therapy and have saved millions of lives. However, after Abraham and Chain described a substance (penicillinase) that could inactivate penicillin (2), Fleming warned that the misuse of antibiotics can lead to loss of their effectiveness in the treatment of life-threatening infections. At the beginning of the 21st century antimicrobial resistance has developed against every class of antimicrobial drug (3) and has become a rapidly increasing global problem (3,4), with widely varying prevalence among countries (5). Resistant bacteria can be rapidly transferred across international borders (6). An important international issue is to avoid further increase in resistance by reducing unnecessary and inappropriate use of antibiotics. The World Health Organization (WHO) and the European Commission (EC) have recognized the importance of studying the emergence and determinants of resistance and the need for strategies for its control (7,8). The European Antimicrobial Resistance Surveillance System (EARSS) and the European Surveillance of Antimicrobial Consumption (ESAC) both funded by the EC were set up (9,10). The purpose of EARSS is to document variations in antimicrobial resistance over time and place and to provide the basis for and assess the effectiveness of prevention programs and policy decisions. The ESAC project aimed to obtain comparable and reliable data about antibiotic use in Europe. Data for antibiotic use were reimbursement, distribution or sales data and did not include information about the prevalence of self-medication by the general population. Information on the prevalence of self-medication with antibiotics would be extremely valuable, in particular when implementing programs aiming to prevent inappropriate use of antibiotics in Europe.

Relevance of self-medication with antibiotics in Europe

Prevalence of resistance is positively correlated with prescribed outpatient antibiotic use on a national level (11-13). Southern and Eastern European countries, in particular, report high levels of both antibiotic use and resistance (12). However, actual consumption of antibiotics may also include self-medication, i.e. using antibiotics obtained without prescription. Other sources of self-medication may include “left-over” antibiotics from treatment courses prescribed earlier, antibiotics obtained from relatives, friends or other sources. Self-medication with antibiotics may lead to a wrong choice of antibiotics, use of

insufficient dosages or unnecessary treatment. This inappropriate use increases the risk of selection of resistant bacteria (14) and may contribute to antibiotic resistance (15). Other problems related to self-medication with antibiotics include adverse effects, drug interactions, masked diagnoses and superinfection.

Self-medication is an important driver of antimicrobial overuse in low-income countries (3). However, the information on self-medication with antibiotics in the high income world is limited. In the US, several studies indicate considerable use of antibiotics obtained from "leftovers"(16-18), a family member, directly from a pharmacy, or from a source outside the US (19,20). For example, in the Hispanic neighborhood of New York city, antibiotics have been found to be available without a prescription (21). In Europe, studies describing self-medication and storage of antibiotics in Spain (22,23), Greece (24,25), Russia (26), and Malta (27) and the UK (28) also suggest a considerable use of antibiotics without consulting a physician. However, these studies were small or used selected samples and were not carried out in Northern and Western Europe. Moreover, due to the different research methods used, no meaningful comparison between countries was possible. In addition, there is little information on "at risk" self-medication i.e. willingness to self-medicate (intended self-medication) and opportunity for self-medication (storage of antibiotics).

Addressing the determinants of self-medication

Self-medication patterns may parallel prescribing habits of physicians (29). Several studies have suggested that patient expectations regarding antibiotic use for self-limiting diseases, such as upper respiratory tract infections (URTIs) may be generated by previous inappropriate prescribing by the physician (16,30,31). A Spanish study found that self-medication use was triggered by prescribed use of the same medication (32). This was likely to be true for antibiotics as they were one of the commonly used medications in the study (32). Previous prescribed use of antibiotics may be a potential determinant of self-medication.

Besides previous prescribed use other factors may influence use of self-medication with antibiotics. Studies conducted in low-income countries found that over-the-counter sale of antibiotics (33), misconceptions regarding the efficacy of antibiotics (34), the cost of medical consultation and low satisfaction with medical practitioners (35) were among the factors related to use of self-medication with antibiotics. A study in the US showed that cultural beliefs and lack of health insurance encouraged residents from Latin-American descent to self-medicate with antibiotics (36). In Europe, differences in attitudes to antibiotic use have been described (37), but little is known about their effect on self-medication. Understanding the relative importance of various determinants for self-medication in Europe is a pre-requisite to develop effective interventions. Most health behaviors are determined by multiple factors. According to the PRECEDE model, health behavior is influenced by predisposing factors

(characteristics that lead to or motivated behavior such as knowledge and beliefs), enabling factors (characteristics that facilitate or are needed to perform the particular behavior, such as the recourses in the environment) and reinforcing factors (rewards and punishments received from others). The PRECEDE model of behavior change (38) is a standardized theoretical framework that has been used to design successful, large-scale health interventions (39,40).

Cultural differences between countries influencing antibiotic use in Europe

Cultural factors may play an important role in the consumption of antibiotics (41;42). Cultural views of infectious conditions that require antimicrobial treatment differ between countries (41). For example, many French people seeking medical care because of cough and sputum production request to be treated by antibiotics; by contrast most Germans consider such treatment as unnecessary overmedication (42). In another study, the Dutch respondents were more confident that mild ailments will heal spontaneously and more skeptical about the efficacy and side effects of medicines while the Flemish were mainly concerned with the risk of doing nothing and "nursing one's illness"(43). A first Pan-European study in five EC countries and Turkey conducted in 1993(37) and extended to other continents(44) suggested that patients' attitudes to antibiotic use varied according to their country of residence. In particular, the proportion of patients definitely expecting to receive antibiotics for respiratory tract infections was the highest in Turkey, France and Spain among European countries. However, that survey did not test whether differences were statistically significant between countries. Moreover, no attention was given to attitudes towards self-medication with antibiotics, awareness about antibiotic resistance and knowledge about effectiveness of antibiotics on bacteria and viruses.

Besides cultural views on antibiotic use, the concept of culture includes broader and general characteristics of a country such as cultural dimensions developed by Hofstede (45). These dimensions represent culture-specific values with regard to general problems faced in all countries and include power distance index (PDI), individualism (IDV), masculinity (MAS) and uncertainty avoidance index (UAI). PDI is a measure for the extent a society is organized hierarchically. It s defined as the extent to which the less powerful members of institutions and organizations within a society expect and accept that power is distributed unequally. If a society scores high on IDV the ties in this society between individuals are loose: a person is expected to look after himself or herself and his or her immediate family only. By contrast, a low IDV score points to a society that is more collectivist in nature. A high MAS-score stands for a society in which emotional gender roles are clearly distinct: men are supposed to be assertive, tough, and focused on material success; women are supposed to be more modest, tender, and concerned with the quality of life. A low MAS-score means a society has a lower level of

differentiation and inequity between genders. UAI is defined as the extent to which the members of institutions and organizations within a society feel threatened by uncertain, unknown, ambiguous, or unstructured situations. Uncertainty avoiding cultures try to minimize the possibility of such situations by strict laws and rules, safety and security measures and people within these cultures are more emotional. The opposite type, uncertainty accepting cultures, are more tolerant of opinions different from what they are used to; they try to have as few rules as possible and people within these cultures are more phlegmatic. It is plausible that cultural dimensions also have an influence on culturally sensitive domains such as illness behavior and use of medicines (46,47). However, very few studies have linked the scores on cultural dimensions with diseases and illness behaviour (48). No study, to our knowledge, investigated correlations between these cultural dimensions and use of medicines.

Objectives and structure of this thesis

This thesis aims to study the prevalence of self-medication with antibiotics in European countries and explore its determinants with a focus on 1) prescribed use of antibiotics, 2) predisposing and enabling factors. In addition, differences in attitudes, beliefs and knowledge concerning antibiotic use and self-medication between countries and the influence of cultural dimensions on antibiotic use in Europe were studied. The study was funded by the European Commission Public Health Directorate DG SANCO.

Chapter 2 presents the results of the survey estimating the prevalence of self-medication with antibiotics and prescribed use in the previous 12 months among the general population of 19 European countries (Austria, The Netherlands, Sweden, United Kingdom, Ireland, Denmark, Italy, Malta, Luxembourg, Belgium, Spain, Israel, Romania, Czech Republic, Slovakia, Lithuania, Slovenia, Croatia and Poland). We also studied "at risk" self-medication, including intended self-medication and storage of antibiotics at home. The demographic characteristics associated with such use, the types of drugs used, the sources of self-medication, the symptoms for which antibiotics were reportedly used, and duration of use were also examined.

In **Chapter 3** we investigate whether self-medication in Europe was triggered by prescribed use. We studied the relationship between prescribed use and self-medication in general (for all symptoms/diseases). We also studied the relationship between prescribed use and self-medication for URTIs.

In **Chapter 4**, we studied the determinants of self-medication by investigating the relevance of predisposing (attitudes, beliefs and knowledge concerning antibiotic use and self-medication)

and enabling factors (country wealth and health care system factors) for use of self-medication with antibiotics.

Moving beyond use of self-medication, in **Chapter 5** we examined attitudes, beliefs and knowledge concerning antibiotic use in general and self-medication between countries.

In **Chapter 6**, we investigate the relevance of cultural dimensions as described by Hofstede for cross-national differences in antibiotic use.

Finally in **Chapter 7**, we discuss general findings of the studies, implications for the strategies to prevent unnecessary and inappropriate use of antibiotics and provide recommendations for future research.

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